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Balloon dilation for the treatment of nasopharyngeal stenosis in seven cats

Stefeny Z Pollack, Peter S Chapman and Alan Klag

Abstract

Objectives The objective of this study was to evaluate the effectiveness of balloon dilation for the treatment of nasopharyngeal stenosis in cats.

Methods The medical records of seven cats with nasopharyngeal stenosis treated with balloon dilation were reviewed. The most common presenting clinical signs included upper airway noise, sneezing, nasal and/or ocular discharge. All seven cats were confirmed to have nasopharyngeal stenosis via nasopharyngeal endoscopy and were treated with balloon dilation under endoscopic guidance.

Results All seven cats had acceptable short-term control (median 14 days) of clinical signs after the procedure. Two of six cats had successful long-term control (median 34 days) of clinical signs after one balloon dilation and an additional 2/6 cats had acceptable long-term control of clinical signs after a second balloon dilation procedure. The most significant complication of balloon dilation was the recurrence of stenosis.

Conclusions and relevance The findings of this study indicate that balloon dilation is a safe and effective treatment option for the relief of clinical signs associated with nasopharyngeal stenosis in cats. Multiple procedures may be necessary for the best chance of long-term success.

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Introduction

Nasopharyngeal stenosis is a pathologic narrowing of the nasopharynx that causes an obstruction of the upper airway. It is an uncommon cause of chronic nasal disease in cats, accounting for approximately 6% of cases in which a definitive diagnosis is obtained.[1] The stenosis is usually caused by the formation of scar tissue.[2] The underlying cause of scar tissue is generally not determined, but inflammation secondary to vomiting of gastrointestinal contents into the nasopharynx, trauma or previous surgery have all been implicated.[3] Underlying chronic infections are also important. These include, but are not limited to, feline herpesvirus, feline calicivirus, *Mycoplasma* species and *Cryptococcus neoformans*.[4] The primary clinical sign associated with nasopharyngeal stenosis is inspiratory stertor, which may or may not be accompanied by sneezing and oculonasal discharge.[5] Differential diagnoses include nasopharyngeal polyps, chronic rhinosinusitis, upper respiratory tract infections and nasal/nasopharyngeal foreign bodies.[1]

The treatment of choice for nasopharyngeal stenosis has not been determined. Non-invasive treatment options include forceps dilation,[1] bougienage and balloon dilation.[6–9] Surgical treatments have also been described, including surgical excision of scar tissue or a mucosal advancement flap.[6,10] Most recently, stenting procedures employing a permanent metallic or temporary silicone stent have been proposed.[11,12] Any treatment modality carries a risk of scar tissue reformation and recurrence of nasopharyngeal stenosis.

Balloon dilation has the advantages of being minimally invasive and relatively simple to perform.

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Furthermore, no implant is left within the nasopharynx. Published data are limited to seven cases. Two initial case reports showed good short-term outcomes with recurrence after 5 weeks and 4 months, requiring a total of two or three treatments.[7] A larger series of cases reported by Glaus et al included five new cases (the report also included the single case that had been described by the same authors in 2002).[8] All five new cats had an acceptable long-term clinical response after single treatment with three cats being clinically normal and the remaining two having persistent clinical signs that were not considered to affect quality of life.[7]

Given the limited number of reports in the literature, the goal of this study was to further evaluate the efficacy of balloon dilation as an initial and definitive treatment for nasopharyngeal stenosis in cats.

Materials and methods

Medical records were searched for cats with a diagnosis of nasopharyngeal stenosis which presented to the Internal Medicine Service at the Veterinary Specialty and Emergency Center in Levittown, PA, USA, between January 2010 and December 2015 that were treated with balloon dilation.

The diagnosis of nasopharyngeal stenosis was based on CT and nasopharyngeal endoscopy in three cats, nasopharyngeal endoscopy alone in three cats, and MRI and nasopharyngeal endoscopy in one cat. No contrast agents were used in either CT or MRI.

All cats were treated in a similar manner. Cats were placed in sternal recumbency and a flexible endoscope (Olympus BF Type P160) was retroflexed around the soft palate and into the nasopharynx. Once nasopharyngeal stenosis was confirmed (Figure 1), a guidewire (Cook Fixed Core Wire Guide Straight 0.35" diameter, 160 cm length – CRE Wireguided 15 mm/16.5 mm/18 mm) was placed in one of two fashions based on clinician preference. Either: (1) the guidewire was passed through the endoscope's working channel and through the stenotic opening under endoscopic visualization with the endoscope in a retroflexed position in the nasopharynx – the guidewire was then passed rostrally until the distal tip could be grasped at the nostril (2/7 cats); or (2) the guidewire was passed through one of the nostrils caudally through the nasopharynx into the common pharynx where the distal tip was grasped with forceps, and brought out via the oral cavity (5/7 cats).

An esophageal balloon dilation catheter (Boston Scientific Alliance II Integrated Inflation/Litho Device and Single-Use Syringe/Gauge Assembly with CRE Balloon Dilators) was then placed over the guidewire such that it passed through the nostril and ventral meatus into the nasopharynx. The balloon was endoscopically visualized in the nasopharynx and advanced until the entire balloon was caudal to the stenosis. Prior to inflation, the balloon was then retracted rostrally so that the widest part of the balloon was positioned just within the stenosis (Figure 2). The size of the initial balloon was selected based on a visual assessment and measurements from diagnostic imaging, where available. If that balloon was undersized and there was only minimal improvement in the stenosis after the first dilation,

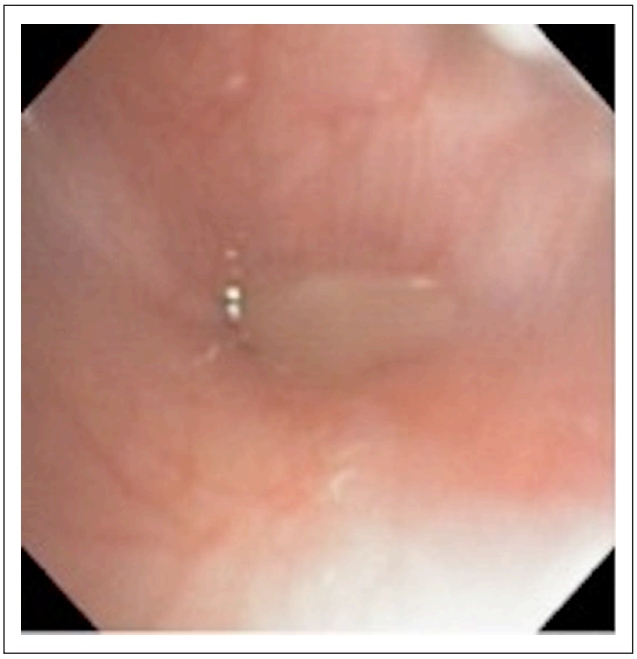

Figure 1 Pre-balloon dilation of nasopharyngeal stenosis with a small amount of mucopurulent discharge occluding the lumen

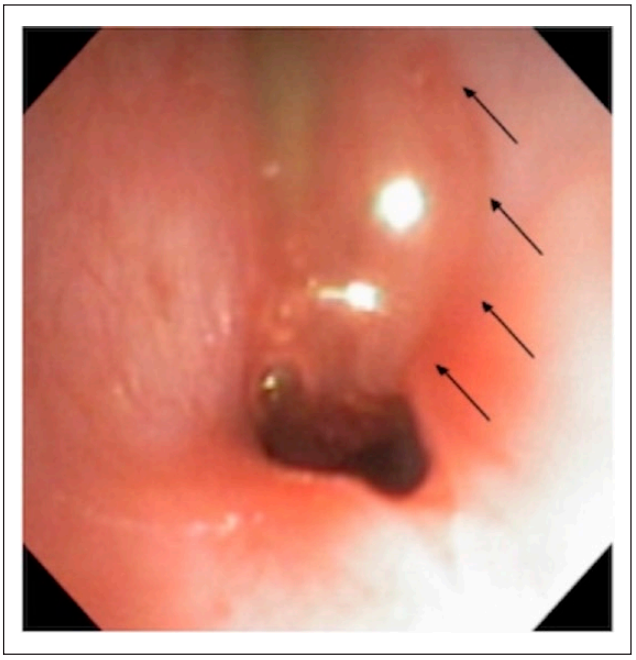

Figure 2 Balloon dilation catheter within the nasopharynx. Black arrows indicate the balloon on the dilation catheter

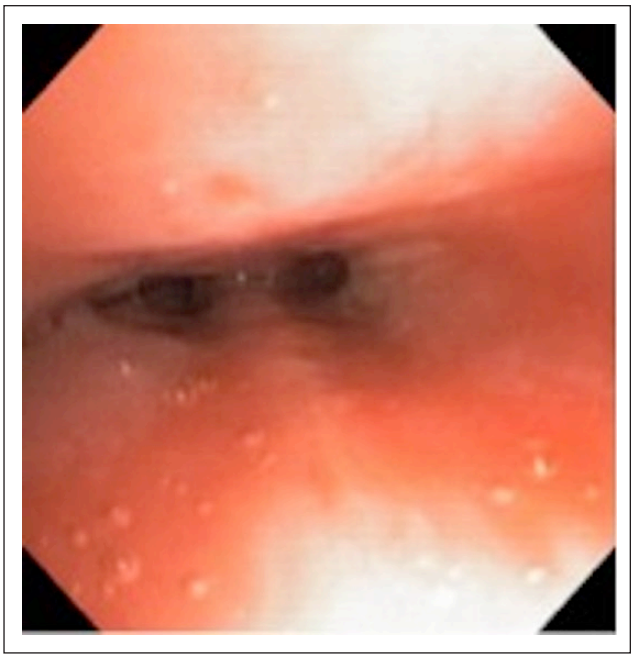

Figure 3 Visible choana, with minimal to no mucosal hemorrhage, post-balloon dilation

successively larger balloons, 8–12 mm, were used. After the procedure, repeat nasopharyngeal endoscopy was performed to confirm dilation and assess the degree of mucosal hemorrhage. The nose was flushed with saline, and all cats received an injection of dexamethasone sodium phosphate (0.2 mg/kg IV) after the procedure.

The short- and long-term outcome of the procedure was assessed from the medical record or through communication with the primary veterinarian and/or owner if inadequate details of follow-up were available in the medical record.

Results

Nasopharyngeal stenosis was treated with balloon dilation in seven cats during the study period. There were six castrated males and one spayed female. The age of the cats at the time of presentation varied from 7 months to 12 years (median 4 years). At the time of presentation, clinical signs had been present for 7 weeks to 10.75 years (median 20 weeks). Reported clinical signs included the following: upper airway noise (7/7), sneezing (5/7), lethargy/exercise intolerance (3/7), nasal discharge (3/7), ocular discharge (2/7; one unilateral and one bilateral), open-mouth breathing (1/7) and decreased appetite (1/7). Six cats had previously been treated with antibiotics and temporary partial improvement was reported in 3/6.

During initial physical examination, six cats were noted to have stertorous upper airway noise. The character of the remaining cat's breathing was described as a high-pitched wheezing-type noise. One cat had an elevated rectal temperature (39.4ºC). Two cats had signs of chronic ocular disease (one with microphthalmia and one with corneal changes) and two cats had missing teeth.

There were no significant findings in the full hematology and serum biochemistry panels in all cats. Serologic testing for feline retroviruses was performed in four cats, all of which tested negative on ELISA both for feline immunodeficiency virus (FIV) antibodies and for feline leukemia virus p27 antigen; one cat was reported to have previously tested positive for FIV antibodies and was not retested. None of the cases were assessed for respiratory tract infections. Thoracic radiographs were obtained in two cats and were unremarkable in both cases.

Based on all imaging modalities, the stenosis was considered by the attending clinician to be mild in one cat; in the other patients there was near-complete occlusion of the nasopharyngeal lumen. Of the four cats in which CT or MRI was performed, three had changes consistent with rhinitis (bony malformation of the sphenoid in one cat, increased density within the nasal cavity consistent with mucus accumulation in two cats), including the cat with mild nasopharyngeal stenosis.

The maximum balloon diameter ranged from 8–12 mm (8 mm in four cats, 10 mm in one cat, 12 mm in two cats). The balloon was serially insufflated for 30 s increments in three cats and 60 s increments in three cats. The duration of dilation was not recorded for one cat. The number of insufflations using one or more different balloon sizes was variable – ranging from 1–12 (median 3). One cat had serial skull radiographs performed during balloon dilation to confirm correct catheter placement.

After dilation, the choana was clearly visible in 6/7 cats (Figure 3). The seventh cat was recovered from anesthesia shortly after balloon dilation, owing to significant hypothermia, and the nasopharynx was not fully re-evaluated endoscopically. In one cat, there was a significant amount of hemorrhage and in three cats there were mild-to-moderate amounts of hemorrhage. In four cats, mucus and debris was identified in the nasopharynx. Three cats were given a single injection of ampicillin intravenously (mean dose 21 mg/kg). All cats had an uncomplicated recovery from anesthesia and were discharged with a short course of tapering prednisolone (starting dose 1–2 mg/kg/day, tapered over 3–4 weeks).

Initial improvement in clinical signs was seen in all cats at the time of discharge from the hospital 4–12 h (median 6 h) after the procedure.

Persistent clinical resolution was noted in all five cats that presented for recheck evaluation 2 weeks after the procedure. The two cats that were not seen at this time were reported to be clinically improved by their owners. Long-term follow-up was available for 6/7 cats. The seventh cat was lost to follow-up.

A recurrence of nasopharyngeal stenosis was confirmed via endoscopy in three cats. These cats presented with progressive, worsening stertor at 5 weeks after the first procedure in one cat and at 21 weeks in another; they had a repeat nasopharyngeal endoscopy and second balloon dilation performed using the same technique as described earlier.

After the second procedure, there were no clinical signs in either cat at 21 days post-procedure in one and at 41 days in the other. The third cat had a relapse of clinical signs 30 days after the initial procedure. A repeat endoscopy at another facility confirmed recurrent nasopharyngeal stenosis and a balloon expandable metallic stent was placed. After this procedure, the stertor resolved, but the cat had recurrent nasal discharge.

Recurrence of nasopharyngeal stenosis was suspected in a fourth cat but not confirmed. The cat had intermittent clinical signs (sneezing, coughing, increased respiratory effort, stertor) starting 4 months after initial balloon dilation. Clinical signs initially responded to repeated tapering courses of prednisolone and doxycycline. However, the efficacy of these medications appeared to wane approximately 22 months after the initial procedure and were discontinued. The owner elected against further investigation and treatment and no subsequent follow-up was available.

The initial balloon dilation procedure was considered to have provided long-term control of clinical signs in the remaining 2/6 cats. One cat had persistent low-grade stertor at the time of last follow-up 3 years after the procedure. The other cat had intermittent recurrence of clinical signs attributed to chronic rhinosinusitis (sneezing, periorbital swelling) and was treated with famciclovir (25–50 mg/kg PO q 12–24 h) and erythromycin ophthalmic ointment (OU q8h), but did not have any signs of upper airway obstruction at 10 months post-procedure. The latter cat had originally presented with wheezing rather than stertorous respiratory noise and had been considered to have mild nasopharyngeal stenosis on endoscopy.

Overall, a single session of balloon dilation was considered to provide acceptable long-term control of clinical signs in 2/7 cats. The success rate after a second procedure increased to 4/7.

Discussion

In this population of cats, balloon dilation of the nasopharyngeal stenosis was effective for short-term control of clinical signs in all cats, but recurrence of clinical signs was common. Long-term success increased after a second procedure.

The clinical signs associated with nasopharyngeal stenosis were similar to those described elsewhere,[5,13] with the most common sign being stertorous respiratory noise secondary to obstructed nasal airflow. The diagnosis of nasopharyngeal stenosis was ultimately confirmed in all patients with nasopharyngeal endoscopy. In three cases, where there was a high suspicion for nasopharyngeal disease based on history and clinical signs, endoscopy was performed without additional imaging studies. Three-dimensional imaging by CT or MRI provided further information about the nasal cavity but did not offer additional diagnostic information regarding nasopharyngeal stenosis above and beyond endoscopy. Moreover, although the stenosis was visualized on endoscopic evaluation in all cases, the diagnostic utility of CT was subjectively inferior with the stenosis being identified on sagittal but not axial reconstructions. MRI was performed in one cat in this report because the CT was unavailable at the time of presentation.

Similar to earlier case reports, balloon dilation in this study resulted in initial alleviation of clinical signs with a subsequent recurrence of clinical signs over the following weeks to months in most cats. A previous case series showed a higher rate of long-term control than was achieved in this study with complete resolution of signs in 3/6 cats and adequate control of signs in an additional 2/6 cats.[7] The reasons for the lower rate of success in the present study are not clear since a similar technique was performed. There may have been differences in balloon choice, balloon position and/or the assessment of an acceptable end point. There may also be heterogeneity of the disease, including severity of stenosis, length of stenosis, location or underlying etiology. One of the cats in this current study was relatively mildly affected and had an excellent long-term response to treatment. However, the assessment of severity is subjective, partly based on owner observations and is difficult to compare between reports. In the other reported case series,[7] three of the cats that were considered to have been successfully treated still had persistent respiratory noise that was not considered to limit quality of life. Additionally, all three cats in that study that had a repeat endoscopy performed did have some degree of recurrence of stenosis.

The high rate of recurrence of nasopharyngeal stenosis after a single balloon dilation can be explained by the nature of the disease. Some reformation of scar tissue is inevitable, especially as the procedure often causes further trauma, ulceration and hemorrhage. By way of comparison, in dogs and cats with esophageal strictures a median of two balloon dilations are required (range of 1–5).[14] It is possible that good outcomes could be harder to achieve with nasopharyngeal stenosis since the surrounding bony structures limit stretching of the scar tissue to a greater degree than does the muscular wall of the esophagus. Additionally, no cats in this study underwent more than two balloon dilation sessions. Further balloon dilations may have resulted in better long-term control in some cats. In this study, prednisolone was

administered to all cats after the procedure in an attempt to reduce scar tissue formation. It is not possible to determine whether this was an effective strategy. One study used topical mitomycin C to try to decrease scar tissue formation. This has been shown to be effective in certain sinus procedures in humans, but no veterinary studies have been performed.[15] Finally, because there was no consistent diagnostic work-up to rule out underlying infectious causes, it is possible that persistent infection contributed to reformation of stenosis in some cases. In future studies, bacterial and fungal cultures, cytology and PCR assays should be considered. If such tests had been performed in the current study, and a particular infection identified, then appropriate treatment may have resulted in a better response and outcome.

The prevalence of chronic rhinitis in cats can also complicate perceived success rates of balloon dilation unless further endoscopic evaluation is performed. In this study, changes consistent with chronic rhinitis were noted in 3/4 cats that had CT or MRI. Four out of the seven cats in this study were reported to have intermittent clinical signs after balloon dilation (sneezing, ocular discharge, periorbital swelling, mild stertor) that could have been consistent either with chronic rhinitis and/or recurrent viral infection. In the one cat with mild nasopharyngeal stenosis, there was a significant chronic rhinosinusitis that may have been contributing to the initial clinical signs and confounding the assessment of outcome.

Alternative procedures have been described to provide longer-term control of nasopharyngeal stenosis. Placement of a balloon-expandable metallic stent was effective in controlling clinical signs in three cats.[11] However, two cats required long-term treatment with prednisolone and the stent had to be trimmed in one cat because it was becoming impacted with hair. These stents may be most suitable for those with a stenosis positioned rostrally, close to the choana, where a stent will not interfere with swallowing or be prone to becoming impacted with food or other material.

A more recent study described placement of a temporary silicone stent to treat nasopharyngeal stenosis.[12] The procedure was effective and without long-term complications in 15 cats in that study. Using the same technique described in that report, our anecdotal experience has been less encouraging, with 2/3 cats having a recurrence of clinical signs. None of these cats were included in the present study.

The retrospective nature of this study presents limitations. The duration of follow-up was variable and outcomes were based on client reports rather than repeat endoscopy and/or imaging in most cases. The size of the dilation catheter and the number of balloon inflations per procedure were not standardized. All cats received an injectable opioid as part of the premedication protocol. The nasopharynx is a sensitive area and cats may benefit from multimodal analgesia. The addition of a local anesthetic block may help to decrease sympathetic stimulation and the amount of inhalation and systemic agents needed to maintain anesthesia.[16] In order to evaluate the benefit of local analgesia, further prospective studies are required. Finally, there was also variation in doses and durations of antibiotic, corticosteroid treatment and antiviral drugs given post-procedure.

Based on the results of this study, balloon dilation is a reasonable initial treatment for nasopharyngeal stenosis that can be performed at the time of initial diagnosis to assist to provide short-term control of clinical signs with minimal risk of complications. However, in most cats, the stenosis will recur, necessitating further treatment. It remains to be determined which of multiple balloon dilation procedures, a temporary silicone stent placement or permanent metallic stent placement is the most effective definitive option.

Conclusions

This is the largest case series to date of cats treated with balloon dilation for nasopharyngeal stenosis. The procedure is safe, effective and relatively easy to perform given the proper equipment and expertise. Although the rate of recurrence is high, the procedure provides rapid relief from clinical signs and can be performed at the time of initial diagnosis. If signs recur, the procedure can be repeated and/or a stent can be placed.

Author note SP gathered case material, supportive evidence and drafted the manuscript. PC and AK participated in providing supportive evidence and editing. All authors read and approved the final manuscript.

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